

REMARKS

Claims 1 through 16 continue to be in the case.

Claim 8 stands withdrawn from consideration.

Claims 1, 9, 10, 12, 13 and 16 are being amended.

1. The Supplemental Amendment filed on August 15, 2001 (Paper No. 15) has been entered. 2. The Supplemental Amendment filed on August 15, 2001 (Paper No. 15) is objected to under 37 C.F.R. 1.121 because applicant's clean and marked-up versions of the amended claims are inconsistent with each other. For example, claim 15 of the clean version calls for a solid rod, however, the marked-up version does not show claim 15, it is shown in claim 17 instead. Due to the inconsistency, the clean version is the one used for examination.

Applicants very much appreciate that the Examiner chose the clean copy of the claims for consideration.

3. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claim 10 (at second occurrence in clean version) has been renumbered as new claim 16.

Applicants thank the Examiner for renumbering what is now claim 16.

4. Claim 8 is withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a non-elected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 10.

Applicants understand that claim 8 is not under consideration.

5. This application contains claim 8 drawn to an invention non-elected with traverse in Paper No. 10. A complete reply to the final rejection must include cancellation of non-elected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Applicants are planning to cancel claim 8 prior to a filing of an appeal.

6. The information disclosure statement filed July 3, 2000 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 1 C(1).

The applicants are thanking the Examiner for pointing this situation out to the applicants and they are presently considering what additional steps appear to be necessary.

7. The listing of references in the specification (German printed patent document 196 40 872.5 on page 5) is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO892, they have not been considered.

If deemed necessary, applicants will supplement their information disclosure.

8. The information disclosure statement filed on August 15, 2001 (journal articles G. Pursche, H. Gropp) which is incorporated into pages 31 and 32 of Paper No. 15 fails to comply with 37 CFR 1.97(c) because it lacks the statement specified in 37 CFR 1.97(e), or the fee set forth in 37 CFR 1.17(p). It has been placed in the application file, but the information referred to therein has not been considered.

Applicants appreciate that the document has been placed in the file.

9. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on July 31, 2000 have been partially approved.

(A) New Fig. 4 has been disapproved because:

(a) new Fig. 4 introduces new matter such as the end piece 4 as now shown. The original Fig. 2 shows that the inner diameter of the pipe 1 is varied: (1) at the junction of the end piece 4 and the pipe 1 as shown by applicant's phantom line; and (2) at referential numeral 1 (see attached Exhibit). However, Fig. 4 shows that the inner diameter of the pipe 1 is constant. The original disclosure does not convey the concept that the inner diameter of the pipe 1 is constant, thus, it is unsupported by the record as filed. In re Anderson, 176 U. S. P. Q. 331 (CCPA 1973); and

(b) new Fig. 4 is inconsistent with the description in Paper No. 9. The insertion on page 6, line 12 of the specification, states that the outer diameter of the end piece 4 is slightly larger than an inner diameter of the pipe 1. However, Fig. 4 shows that the outer diameter of the end piece 4 is equal to the inner diameter of the pipe 1.

(B) The corrected Fig. 3 has been disapproved since it introduces new matter. The original drawings do not show the bearing rings. The corrected Fig. 3 now shows the bearing 6 which is identical to the cam 3. The showing and description of a specific type of bearing within a full spectrum of possible bearings is considered under the present disclosure to be new matter. Cf, In re Smith, 173 U.S.P.Q. 679 (CCPA 1972) and Exparte George, 230 U.S.P.Q. 575, 578 (Bd. Pat. App. & Inter. 1986).

(C) The corrected Fig. 1 has been approved.

The applicants thank the Examiner for the approval of some of the drawings and will provide further efforts to correct the remaining drawings.

10. The original drawings are objected to because: (a) the drawings should show the plane upon which a sectional view such as Fig. 1 is taken; and (b) each part of the invention such as the solid rod in claim 15 should be designated by a referential numeral or character. Correction is required.

11. The original drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claimed features such as the bearing rings in claims, 1, 6, etc., and the solid rod in claim 15 must be shown or the features canceled from the claims. No new matter should be entered.

The drawings merely show the pipe 1 as described on page 6 of the specification.

Applicants will provide drawings along the lines suggested by the Examiner.

The applicants are herewith submitting new drawings.

NM Fig. 9 is a schematic sectional view through an camshaft segment with a pipe and bearing rings.

Fig. 9a is a schematic sectional view through an camshaft segment with a rod and bearing rings.

Fig. 10 is a schematic sectional view through a camshaft end with a pipe.

Fig. 10a is a schematic sectional view through a camshaft end with a rod

Fig. 11 is a perspective view of the entire camshaft with rings.

Fig. 11a is an elevational view of the entire camshaft with indicated cutting planes AA and BB.

Fig. 12 is a schematic sectional view through a camshaft segment with a pipe and bearing rings.

Fig. 13 is a schematic sectional view through a camshaft segment with a rod and bearing rings.

Fig. 14 is a schematic sectional view through a camshaft segment with a pipe.

Fig. 15 is a schematic sectional view through a camshaft segment with a rod.

Fig. 16 is a schematic sectional view through a camshaft segment with a pipe.

Fig. 16a is a schematic sectional view through a camshaft segment with a rod.

Fig. 17 is a schematic sectional view through a camshaft end with a pipe.

Fig. 17a is a schematic sectional view through a camshaft end with a rod.

Fig. 18 is a perspective view of the entire camshaft.

Fig. 18 is a perspective view of the entire camshaft with indicated cutting planes AA and BB.

12. The amendment filed February 23, 2000 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is, e.g., as follows:

(A) the insertion in line 9 on page 6 of the specification. The original disclosure does not convey the concept that the cam 3 shown in Fig. 1 has

an opening diameter slightly smaller than an outer pipe diameter, thus, it is new matter. In re Anderson, supra.

Applicants are herewith canceling the objectionable insertion.

(B) the insertion in line 12 on page 6 of the specification. The original disclosure does not convey the concept that the outer diameter of the end piece 4 is slightly larger than an inner diameter of the pipe 1, thus, it is new matter. In re Anderson, supra; and

Applicants are herewith canceling the objectionable insertion.

(C) the insertions in lines 13 and 14 on page 6 of the specification. The original drawings do not show the bearing rings. The corrected Fig. 3 now shows the bearing 6, which is identical to the cam 3. The showing and description of a specific type of bearing within a full spectrum of possible bearings is considered under the present disclosure to be new matter. Cf, In re Smith, 173 U.S.P.Q. 679 (CCPA 1972) and Exparte George, 230 U.S.P.Q. 575, 578 (Bd. Pat. App. & Inter. 1986).

Applicants are herewith canceling the objectionable insertion.

Applicant is required to cancel the new matter in the reply to this Office action.

Applicants are canceling the objectionable insertions as required.

13. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter such as "an elongated part" in claim 10. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction is required. The elongated part of claim 10 is seen in the drawing figures.

15. Claim 15 stands rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 15 calls for a solid rod. However, applicant's drawings show only a pipe as described on page 6 of the specification. It is unclear as to how applicant makes/uses the camshaft that has an elongated part being a solid rod as claimed.

→ Applicants are in the process of providing an additional drawing showing a solid rod.

16. Claims 1-7 and 9-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term such as "conventional compression joints" in claim 1 is vague and indefinite since it is not clear what type of compression joints are considered to be "conventional."

Claim 1 has been amended to cancel the objectionable language.

It is unclear whether:

(a) the terms that appear at least twice such as "a joint-stable surface" and "a longitudinal compression joint" in claim 10 refer to the same or different things. See M.P.E.P. 2173.05(o). Applicant is respectfully urged to identify each claimed element with reference to the drawings; and

(b) a confusing variety of terms such as "a compression joint," "compression joints" and "a stable joint" in claim 9 refer to the same or different things. See M.P.E.P. 608.01(o). Applicant is respectfully urged to identify each claimed element with reference to the drawings.

? The term "stable joint" should be read in claim 9 together with the following closer determination of this term.

No antecedent basis is seen for the term such as "the outer jacket face" in claim 13.

Claim 13 is being amended to provide an antecedent basis.

The use of alternative expressions such as "or" and "and/or" in claims 12 and 16 renders said claims vague and indefinite.

Claims 12 and 16 are being amended to avoid the objection.

17. Claims 1-7, and 9-16, as best understood, stand rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U. S. C. 103(a) as obvious over Seim et al. (Publication "Erhöhung der Sicherheit gehäuter. . ." cited in EPO Search Report in the parent application).

The Office Action refers to the rejection under 35 USC 102(a)

Regarding claim 1, Seim teaches a built-up camshaft comprising a pipe coated by a joint coating on outer and inner cylindrical surfaces (id., Table on page 289 and Fig. 12 on page 290) and having outer and inner pipe diameters; and having cam places, bearing ring places and pipe end places (e.g., Figs. 1 and 2, page 284 and Fig. 5 page 286); cams formed as rings with outer and inner cylindrical flanges (Fig. 12) and provided with the joint

coating on an inner cylindrical surface of the inner flange and having a cam opening diameter. The outer end pieces of Seim inherently have an outer diameter bigger than the inner pipe diameter so that its outer end can be slipped into the pipe and joined to the pipe.

Note that Seim's camshaft inherently has the bearing rings and end pieces. In fact, the bearing rings and end pieces are notoriously conventional in the camshaft art (see, e.g., US Patent No. 5,299,881 issued to Mettler-Fnedli and references classified, e.g., in Class 74, subclass 567, and Class 123, subclass 90.6 of the Office). Without the bearing rings and end pieces, one would not be able to assemble or mount Seim's camshaft to other parts of the internal combustion engine, i.e., it would be inoperative for its intended purposes.

Applicants take no issue with the position of the examiner that the publication of K. Seim, Gropp H., P. Tenberge : "Increase of the safety of built cam shafts by employing coated press connections" already shows that cams can be attached tubes. The table in the article K. Seim et al. on page 298 there's generally compared by way of selected experimental results, that the torque for disengaging of a cam on a shaft (disengagement moment) and the moment to be furnished for sliding (sliding moment) is substantially higher in case of employing a shaft with a compound stable conversion layer as without coating (dry) or with a MoS₂ oil paste or with MoS₂ powder.

These are general investigations, which were performed in connection with shaft hub connections, and however not especially in case of built camshafts.

Figure 12 of the reference Seim et al. on page 290 shows in b) a toothed shaft - toothed hub connection of a subway axle drive by a press connections with phosphated press surface.

The thin wall tube has an inner diameter and an outer diameter. The

-hub and a

-ball bearing

Are placed on the outer diameter of the tube (hollow shaft).

According to this construction

-no cams are attached to the outer diameter of the tube, and also

-no end piece is disposed at the inner diameter of the tube end.

Therefore figure 12 B. of the reference Seim et al.

does not give any suggestion for the production of a complete built cam shaft with end pieces, cams, and bearings and alike by way of a longitudinal press connection while employing a compound stable conversion layer.

The sections 2.1 and 2.2 of the reference Seim et al. described completely different joining methods for the construction of built up camshafts.

Section 2.1 (figure 1) on page 284 describes how cams and bearings are attached to hollow shaft (2), where the hollow shaft mechanically widened by a widening tool. As the examiner correctly recognizes ring shaped cams and a bearing are disposed on a shaft. The ring shaped cams and the bearing

are position initially with gray on the shaft. In the following a widening tool is pulled through the inner diameter of the tube (expansion thorn). The outer diameter of the widening tool is larger than the inner diameter of the tube so that the tube becomes widened and is firmly pressed against the inner diameter of the cam. This generates the connection between tube and cam. As far as end pieces are concerned, they cannot be attached to a shaft by employing an expansion thorn. Thus there is a lack of teaching as to an application of end pieces in the Seim et al. reference.

Section 2. 2 and figured to of the reference Seim et al. described the construction of built cam shafts according to the inner high-pressure method. Cams are positioned on the outer diameter of the tube with play. In the following the tube is filled with liquid and expands based on the high-pressure of the liquid such that the outer diameter of the tube becomes increased and is formed against the inner diameter of the cam (section A-A). Based on the high liquid pressure it is possible to produce also even bearing positions (section B-B) or other form elements, for example hexagons (section C-C).

Again this method recited does not allow an attachment of end pieces. The figure 5 of the Seim et al. reference shows a hollow shaft (2) with cams attached thereto however without bearing rings and end pieces. The comparison tensions in the cam and the hollow shaft are illustrated as they are generated in connection with conventional cross press connection, which was produced with an over measure of 63 micrometers (compare figure 4 of

the Seim et al. reference). The comparison tensions is disposed in the region of the flow limit in such cross press connections.

The danger exists hereby, that in case of bend tensions and torque tensions the stability and durability of the camshaft is no longer assured.

Therefore, a complete built camshaft cannot be found in the reference Seim et al., where such complete built camshaft would be constructed by the present Invention method.

All individual parts -- cams -- bearing rings -- ernd pieces -- are connected to the shaft and to each other by a longitudinal press connection under employing a compound stable conversion layer. The advantage of the present Invention method in comparison to the cross press connection (figure 5 of Seim et al.) comprises that no such high comparison tensions (up to the region of the flow limit) occur. In case of bending tensions and torque tensions thus there is given a substantially larger durability of the built cam shaft according to the present Invention as compared to outer constructions. Applicants respectfully submit that the Invention method as claimed is clearly novel and patentable over the reference Seim et al.

18. Claims 9-16, as best understood, stand rejected under 35 U.S.C. 103(a) as being unpatentable over Seim in view of Mettler-Friedli (US Patent No. 5,299,881).

Japanese Utility Model # 61-166980 (Fig. 1), Japanese Utility Model # 8-93884 . Regarding claims 9-16, Seim teaches the invention substantially

as claimed. However, Seim does not explicitly teach the bearing rings and the end pieces. See page 23 of Paper No. 15.

Mettler-Friedli teaches the conventional bearing rings and the end pieces 2, 2a, 12, 13 in order to mount the camshaft to an internal combustion engine as seen in line 19 et seq., column 5.

Applicants submit that the construction according to Mettler-Friedli in fact describes the cam shaft comprising a hollow shaft, cams, bearing rings and end pieces, however generally form elements are employed here at the circumference of the connection, based on which form elements the safety of the cams or of the bearing rings against rotation is assured on the shaft.

Applicants observe that they are no simple considerations, which would allow to obtain the present Invention in view of the conventional constructions according to Seim et al. and Mettler-Friedli.

The present Invention operates according to the principle 'joined and finished' and correspondingly the coated individual parts are shifted and press in the shape of cams and bearing rings onto the tube and the end pieces into the tube and therewith the production process is finished. The simple construction process according to the present Invention is associated with substantial savings of production time and costs in comparison to the constructions thought in the references Seim et al. and Mettler-Friedli.

The production of a complete built cam shaft, where all parts (cams, bearing rings, and pieces) and not only the cams are connected by press

connections with compound stable conversion layers as in (2), therefore are absolutely new and represent a clear advance relative to the state of the technology together with nonobviousness.

The pressing one of the cams and of the bearing rings as well as the pressing of the end pieces is only possible by the application of special press surface coatings with inorganic nonmetallic compound stable conversion layers.

This connection is extremely durable as is shown on page 298 of the reference Seim et al.. The stability has been proven for example at the shaft hop connection of the subway axle gears. Such years employing this shaft hop connection are employed in the subway of the cities of Berlin and Athens already since 1982 without any failure.

In the durability is thus given with the built cam shaft and was proven by corresponding experiments. Disengagement moments of 200 Nm were obtained with the Invention cam shaft according to experiments in the requirements of the cam shaft producers here are disposed only at an assurance of a torque and a level of 20 to 40 Nm. These conditions are surpassed by multiple with the cam shaft according to the present Invention.

Applicants repeat again that an essential feature of the present Invention comprises that the cam and the bearing rings between the outer diameter of the hollow shaft and the inner diameter of the cam and also between the inner diameter of the hollow shaft and the outer diameter of the hollow shaft there is disposed a compound stable conversion layer

(phosphate layer), which conversion layer assures the corresponding durability and safety against rotation of the connection.

The present amendment is intended to present claims which are deemed to be in better form for appeal.

The present amendment is deemed to remove and/or simplify issues, which would otherwise require consideration in an appeal.

The present amendment is believed not to present any new issues since the claims are substantially based on previously presented claims and since such limitations had been individually submitted earlier and had been considered earlier.

It is submitted that the amendment is a bona fide attempt to advance the prosecution by amendments to the claims seeking to overcome rejections based on the applied prior art and/or rejections under 35 U.S.C. 112.

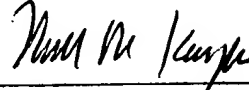
It is submitted that the present amendment complies with observations made in the Final Rejection.

Reconsideration of all outstanding rejections is respectfully requested.

Entry of the present amendment is respectfully requested. All claims as presently submitted are deemed to be in form for allowance and an early notice of allowance is earnestly solicited.

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MARKED-UP VERSION OF THE AMENDED CLAIMS

1. (four times amended) A built-up camshaft comprising a pipe coated by a jointing coating on an outer cylindrical surface and an inner cylindrical surface and having an outer pipe diameter and an inner pipe diameter and having cam places, bearing ring places and pipe end places; cams formed as rings with an outer cylindrical flange and an inner cylindrical flange and provided with the jointing coating on an inner cylindrical surface of the inner cylindrical flange and positioned at the cam places and bearing rings provided with the jointing coating on inner surfaces being in contact with the pipe and positioned at the bearing ring places and end pieces provided with the jointing coating on outer cylindrical surfaces and having an outer end pieces diameter bigger than the inner pipe diameter, wherein the jointing coating of the pipe and the jointing coating of the cams, the bearing rings and the end pieces create durable joints between the pipe and the cams, the bearing rings and the end pieces and wherein the surface coating prevents a tribocorrosion and increases load capacity as compared to [conventional] compression joints without joining coating.

9. (amended) A built-up camshaft comprising a pipe coated with a crystalline phosphate coating on an outer cylindrical surface and having an outer pipe diameter;

a cam having an inner diameter larger than the outer pipe diameter and connected by means of a compression joint to the pipe and provided with the crystalline phosphate coating on surfaces being in contact with the pipe, wherein the crystalline phosphate coating prevents a tribocorrosion and increases load capacity as compared to compression joints without coating and creates a stable joint between the pipe and the cam;

a bearing ring having an inner diameter larger than the outer pipe diameter and connected by means of a second compression joint to the pipe and provided with a second crystalline phosphate coating on surfaces being in contact with the pipe, wherein the second crystalline phosphate coating prevents a tribocorrosion and increases load capacity as compared to compression joints without coating and creates a stable joint between the pipe and the bearing ring;

an end piece having an inner diameter larger than the inner pipe diameter and connected by means of a third compression joint to the pipe and provided with a third crystalline phosphate coating on surfaces being in contact with the pipe, wherein the third crystalline phosphate coating prevents a tribocorrosion and increases load capacity as compared to compression joints without coating and creates a stable joint between the pipe and the end piece.

10. (amend) A built-up camshaft comprising
an elongated part having an outer cylindrical surface;

a cam connected by means of a longitudinal compression joint to the elongated part, wherein the cam is covered with a joint-stable surface coating, and wherein the surface coating prevents a tribocorrosion and increases the load capacity as compared to compression joints;

a bearing ring connected by means of a second longitudinal compression joint to the elongated part, wherein the cam is covered with a second joint-stable surface coating, and wherein the surface coating prevents a tribocorrosion and increases the load capacity as compared to compression joints;

an end piece connected by means of a third longitudinal compression joint to the elongated part, wherein the cam is covered with a third joint-stable surface coating, and wherein the surface coating prevents a tribocorrosion and increases the load capacity as compared to compression joints.

12. (amended) The camshaft according to claim 10, wherein the pipe or the solid rod, [and/or] the cams, the end pieces, the bearing rings, and the other parts are made out of metal, ceramics, plastics or other materials, by cutting or non-cutting, by milling or forging in massive or profiled form.

13. (amended) The camshaft according to claim 1, wherein [the] an outer jacket face of the pipe or of the solid rod has a drawn quality or is completely or partially mechanically machined.

16. (amended) A built-up camshaft comprising
a pipe or a solid rod,
cams,
bearing rings,
end pieces, and
other parts, wherein the cams (3), the end pieces (6), the bearing rings, and
the other parts are connected by means of longitudinal compression joints to
the pipe [or to the solid rod], wherein the parts to be connected are provided
with a suitable surface coating, and wherein the surface coating prevents a
tribocorrosion and increases the load capacity as compared to conventional
compression joints.